

An analytical case study of Bengal style terracotta temples in Maluti temple village in Dumka District of Jharkhand, India

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Received 2 March 2025; revised 10 May 2025; accepted 15 May 2025

A unique temple village exists in Dumka district of Jharkhand, known as Maluti, which is renowned for existence of 72 terracotta temples dating back to the 17th-18th centuries exhibiting the distinctive Bengali styles of temple design. Once numbering 108, there was gradual decay and loss of about one-third of the temples. This paper provides a comprehensive case study of the temples of Maluti. The objectives of this paper are to examine historical roots, religious practices, and cultural significance of these temples; explore their architectural aspects, including layouts, designs, ornamentation, structural and seismic characteristics; assess the challenges the temples face due to weathering and erosion; and suggest measures for tourism development at Maluti. Despite extreme abundance, no academic research has ever been done on the terracotta temples of Maluti. This is a first-of its kind research on the temples undertaken from an architectural perspective involving primary survey. The paper also relies on secondary sources of information. It offers profound insights into the fusion of architectural styles and artistic expressions and the richness of the culture of Bengal, and specific recommendations for enhancing tourism so that the world can see these architectural treasures and their enduring contribution to Bengal's cultural landscape, which shall not only garner economic momentum in this largely unknown village, but also enable preservation of these temples for generations to come.

Keywords: Char-chala, Dalan, Do-chala, Maluti, Rasmanch, Rekha deul, Terracotta plaques, Terracotta temples

IPC Code: Int Cl.²⁵: A47G 33/02

Terracotta conjures up images of Terracotta Army of China and the temples of Bishnupur in India. However, deep within the hinterland of the Indian state of Jharkhand, a unique temple village exists in Dumka district, known as Maluti- a veritable storehouse of a large number of terracotta temples dating back to the 17th-18th centuries. Maluti is home to the solitary Bengali-style architecture in Jharkhand. The temples built entirely of bricks spread across almost the entire village are feast to the eyes. Dedicated to numerous Hindu Gods and Goddesses, the temples narrate stories of religious beliefs and artistic brilliance.

Once a vibrant village with 108 temples, harsh weather, ravages of time, and lack of maintenance¹ caused their gradual deterioration and loss of their exquisite terracotta artwork as time passed. Worsened by overgrown vegetation and massive water leakage from their roofs and walls, 36 of the temples crumbled over time and were eventually lost. The 72

surviving temples were in various stages of decay and some in ruins, *awaiting the same fate*², when attention of Government of Bihar (undivided) was drawn to Maluti, which declared all the 72 temples protected and attempted to repair them. However, this important cultural heritage suffered due to lack of sustained efforts and shortage of trained local manpower, until the Republic Day parade of 2015, when Jharkhand's tableau featuring its temples won a prize putting Maluti into limelight, drawing personal attention of the Prime Minister of India towards their restoration².

Maluti exudes similarities with Bishnupur – the old city of the Malla rulers of Bengal, most notable for its terracotta temples. The unique architectural style of Maluti's temples resembling the distinctive Bengali temple architecture bearing elaborate terracotta plaques depicting mythological scenes on their front facades has immense heritage value and tourism potential.

It is however, a surprise in itself that such a non-descript village like Maluti has so many exquisite and architecturally important terracotta temples within

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a comparatively small area of sixteen hundred square metres².

This brings us to the questions as to who built such a large number of temples in the small village of Maluti and why? What are the architectural and structural characteristics of these temples? What is their religious and cultural significance? What are the challenges faced by these temples?.

The objectives of this paper are to examine historical roots, religious practices, and cultural significance of these temples; to explore their architectural aspects, including layouts, design, ornamentation, structural and seismic characteristics; to assess the challenges of weathering, and erosion; and to suggest measures for tourism development at Maluti.

Materials and Methods

This paper is based on a comprehensive analytical case study of the temples of Maluti. Case study involves primary survey undertaken in January 2025. The locations of the temples were marked on a Google image of Maluti. Measurements and photographs of architectural elements of the temples were taken, which formed the basis for detailed drawings, categorization and analysis of the temples. Information was also gathered from secondary sources such as books and journal paper.

Study area

Maluti (Fig. 1) is a village (bearing latitude 24°9'N and longitude 87°40'E) located in Shikaripara Block of Dumka District under Santhal Pargana division of

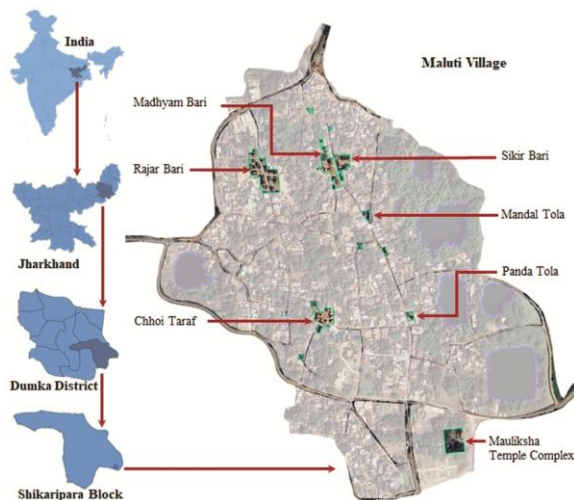


Fig. 1 — Location of Maluti showing various temple-clusters (adapted from google.com)

Jharkhand with the Chandananala, flowing along its southern boundary, forming the natural division between Jharkhand and West Bengal. Maluti is located on Dumka-Rampurhat bus route. Rampurhat railway station in West Bengal is only 16 km away. Maluti is located closer to Kolkata (226 km) than Ranchi (331 km) – the capital of Jharkhand².

Oval in shape, Maluti is 700 m long and 400 m wide with a north-south axis, having a population of over 3,000; cultivation being the mainstay. Maluti is surrounded by tribal villages of both Jharkhand and West Bengal amidst beautiful natural forests, hills and streams owing to its location at the extreme end of the undulating Chhotanagpur plateau². The climate of Maluti is pleasant and healthy similar to other health resorts in Jharkhand.

Results

This section details out historical background, cultural significance, architectural details, structural and seismic characteristics, and challenges posed to Maluti's temples.

Historical roots, religious practices, and cultural significance of the temples

Gaining fame in 15th century, Nankar *raj* (a tax-free kingdom), including Maluti, was awarded by Sultan Alauddin Husain Shah of Gaur (1494-1519 CE) in early 16th century to Basanta Roy, a young shepherd son of a poor Brahmin of Katigram village for catching and returning the lost pet *baj* (hawk) of the sultan. Since known as Baj Basanta, he established a dynasty with its capital at Damra (about 8 km south of Maluti) in 1520 CE. However, successive generations of Baj Basanta shifted their capital in late 17th century to Maluti, which remained the capital of Nankar Kings for about a century².

The dynasty of Baj Basanta split into *choutaraf* (four clans), with Rajar Bari (King's house), Madhyam Bari (house of the second clan), and Sikir Bari (house of the third clan), and Chhoi Taraf (the clan with six descendants). Each of these four *tarafs* (clans) excavated several ponds in Maluti aimed at improving agriculture, generated vast revenues, distributed grants to scholars, and started the culture of *puja* (worship) at various occasions that promoted religion. Religious inclinations of Baj Basanta greatly influenced his descendants, who instead of building palaces for themselves, spent considerable revenue constructing temples in Maluti. The earliest is a Shiva temple built by Raja Rakhar Chandra in 1719 CE

inside Mauliksha temple complex. By 1859 CE, altogether 108 temples were constructed within a radius of 350 meters, turning Maluti into a unique temple village full of terracotta temples as exceptional cultural heritage².

The temples were constructed for various reasons. The main reason was competition between the four clans for prestige – who went on building temples within their clusters on auspicious occasions while themselves living in ordinary mud houses. Even more significant was the clash of egos among the women of the families, who would take offense in visiting a temple constructed by the husbands of other women, indicating that temple building had become a status symbol. Also, the construction of such temples is easy and simple, which resulted in a large number of temples built in Maluti, suggesting a focus on religious propagation².

The period that witnessed a revival in temple construction, which had stopped after the Islamic conquest of Bengal in the 13th century³, is also “called the ‘Pauranic Renaissance’ through impetus from Sri Chaitanya (1486-1533), the exponent of ‘gauriya’ Vaishnavism, whose active life in Nabadwip and popularization of the Sanskrit scriptures translated in Bengali was building up from the late 14th century”⁴. Nearly all the surviving temples of 16th-17th century in Bengal are Radha-Krishna temples, having Vaishnava terracotta decorations. However, a large number (57 of the 72) of temples at Maluti are dedicated to Lord Shiva; for which it is also known as Guptakashi – reminiscent of Shivapuri Kashi or Kashidham (Varanasi). Very few temples are dedicated to Vishnu and his *avatars*, Rama and Krishna. The presence of so many Shiva temples in close vicinity was the influence of their *Rajguru* (patriarch of the Nankar kings) who is the head of the Sumeru Math of Kashi, also known as *Dandiswami* who have faiths aligned on the doctrine of *Shaiva* by Adi Sankaracharya².

Temples are also dedicated to goddess Mauliksha – the tutelary deity of royal family and the Guardian Goddess of Maluti, sage Bamakhepa, and to Goddesses Shakti, Durga, and Kali, contributing to the diversity of religious and cultural landscape².

Functioning as religious and cultural hubs, the temples host festivals and rituals, fostering community engagement and local participation. Integral to the social fabric, Maluti's terracotta temples nurture a sense of community's identity and pride.

Architectural characteristics of Maluti's terracotta temples

Found distributed almost all-over Bengal, Bangladesh^{4,5}, and parts of present-day Jharkhand, Bihar, Assam and Tripura, the region “witnessed the emergence of a drastic (ally) divergent style of temple architecture” in the rise of Terracotta Temples in 16th-19th century⁵. These temples, “famous for the use of Terracotta Plaques for surface decoration,” stand as “the epitome of culmination of various influencing factors such as geographical, geological, structural, social or political”⁵ and “as the Hindu artistic expression of the new social, religious and cultural revolution” which imparted Bengal “a distinct regional identity”⁶.

Evolution and emergence of variants of the terracotta temples of Bengal manifested under the patronage of the Malla kings of Bishnupur from where the styles proliferated to various places in West Bengal⁵. The Malla art and architecture (including construction of numerous terracotta temples – particularly in Bishnupur – renowned for their unique ornamentation through terracotta plaques, depicting mythological scenes from Hindu epics, each temple show casing intricate designs and detailed craftsmanship) have exerted tremendous influence on Maluti's temple architecture, which diffused to Maluti due to its proximity to Bishnupur¹. The terracotta technique using baked moulded clay has been applied extensively.

While the preferred axis towards a particular direction present in other Indian temples is quite subdued⁶, the most remarkable characteristic of the temple architecture in Bengal is the departure in tradition from Dravidian and Nagar styles, the two major styles traditionally seen in Indian temple architecture², and developing a unique and distinct style coinciding with its Islamic conquest^{5,6}. The divergence include a conspicuous absence of the prevalent “sequence of *Bhogmandapa*, *Natmandapa*, *Garbhagriha*”⁶ (offerings hall, dance pavillion, sanctum sanctorum), instead comprising a single – square, rectangular or octagonal – chamber forming the *Garbhagriha* surmounted by a *shikhara* (spire/curved roof) of limited size, generally having slender walls (thicknesses between 75-125 cm)⁶. The external forms of the temples were dictated by their roof structures⁵.

Typology

Maluti's temples are built in a distinctive architectural style, typically arranged in clusters of two, three or more temples. There are altogether

seven clusters – the four clans having one each, Mauliksha temple complex, Mandal Tola, and Panda Tola – whereas four temples are scattered in isolation. The temples are classified, based on their design, into five categories – *Chala* style, *Rekha Deuls*, Octagonal temples with pyramidal *Shikhars*, *Mancha* style, and *Dalan* (flat-roofed) (Table 1).

Chala (Bengal hut shaped roof) style

The distinctive terracotta temple architecture has its roots in the characteristic traditional thatched *kutir* (hut) of rural Bengal² “closely related to the paddy roofed traditional building(s)”³. Its “curved cornice taken from the bent bamboo eaves” suitable for excessive rains, and terracotta decorations indigenous to a region without stone⁴, which transformed to brick architecture with the roof comprising “the pointed vault” having “curved base and spine, producing the

interior of a Bangla roof form”⁶. Such curved pyramidal roofs with curved edges, colloquially called *chala*, are distinct features of the temples of Maluti⁴.

The *chala* temples comprising a single chamber on a square platform² are distinctive due to variations of their roof-structures ranging from *ek-chala* (slope in a single direction) to *barah* (twelve)-*chalas*. Roofing styles include *do-chala* (roofs sloping in two directions with a central ridge and gable ends), *jor-bangla* (twin ‘*do-chala*’ attached to each other with their gable ends in the front and rear), *char-chala* (roofs sloping on all four sides) and *ath-chala* (a smaller ‘*char-chala*’ built over a bigger ‘*char-chala*’). The roofs of the *chala* temples are less steep than other temples⁵. Two types of *chala* temples are found at Maluti – *do-chala* and *char-chala*.

Table 1 — Typologies of temples at Maluti (Source: Prasun Kumar)

S. No.	Temple typology	Number existing
1.	<i>Chala</i> style <i>Char-chala</i>	50
	<i>Ek-Bangla/Do-chala</i> style	1
2.	<i>Dalan</i> style	14
3.	Octagonal Temples with pyramidal <i>shikhars</i>	4 (one triplet + one)
4.	<i>Rekha Deul</i>	2
5.	<i>Rasmancha</i>	1
	Total	72

Do-chala/ Ek-Bangla temples

Such temples consist of roofs sloping on two sides following the pattern of huts, mostly in villages of East Bengal (now Bangladesh)⁴ and comprise *garbhagriha* to accommodate the deity. Only one such temple is present at Maluti, dedicated to goddess Mauliksha (Fig. 2a). One of the oldest and the finest examples of a traditional Bengali style, Mauliksha temple, is single-storied, comprising a *garbhagriha* and an independent *sringara* (prayer space) and entrance to the west, with just a covered laterite sculpted head of Mauliksha fixed on the altar².

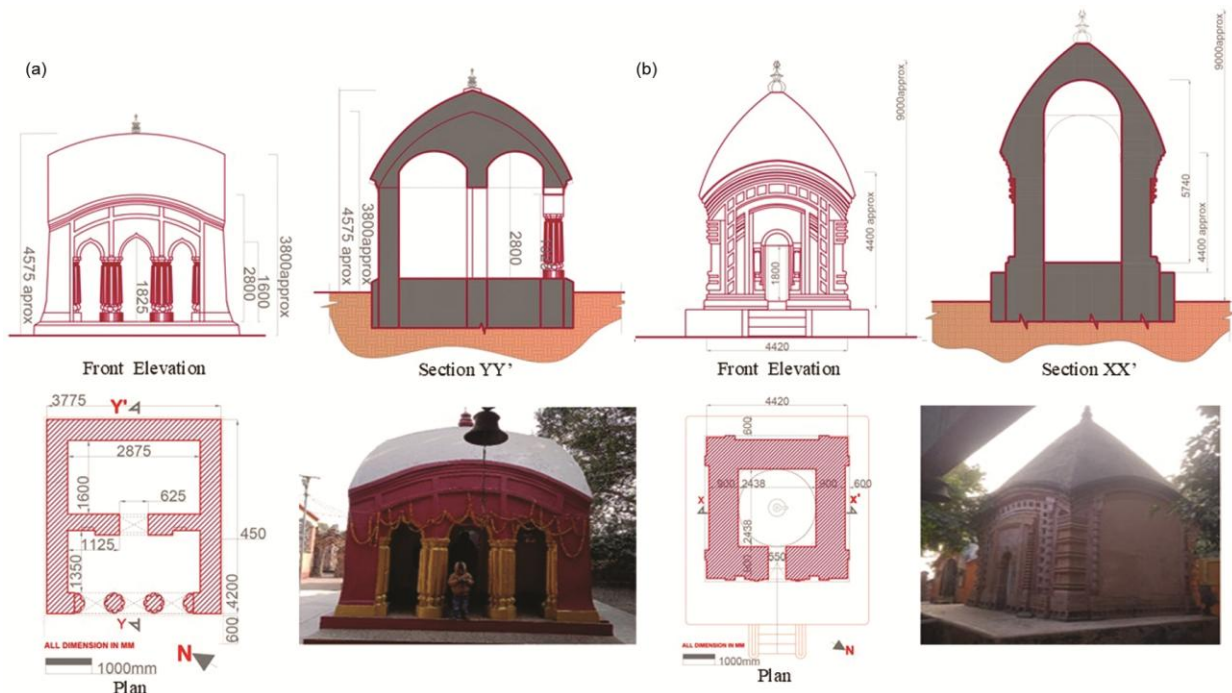


Fig. 2 — Details of (a) a *do-chala* (Mauliksha) temple, and (b) a *char-chala* temple

Char-chala temples

The predominant typology of the temples at Maluti is *char-chala* (Fig. 2b), the most common architectural form in rural Bengal. It is used in the construction of 50 of the 72 temples. The characteristic appearance of such temples are derived from low *shikharas* sloping on four sides² constructed as a dome on pendentives having corbelled cornices⁴.

Interestingly, all the *char-chala* temples at Maluti are dedicated to Lord Shiva. They ranged from 4.58 m (15') to 18.3 m (60') in height, comprise a single, diminutive entryway, and narrow doorways only about 1.37 m (4'6") high². The *char-chala* temples have the grandeur of a *shikhara* imparting a striking visual impact.

Dalan (Flat roofed temple) style

Dalan style temples (Fig. 3a) are simple in design with a square or rectangular plan having walls on three sides and open at the front; pillars in front supporting the wider spanning roofs. These are smaller than the *chala* temples. *Dalan* style temples are flat roofed and have conspicuous absence of *shikhara*. Figures of two tigers and flying fairies in their front facades atop the parapet indicate British colonial influence. Fourteen *dalan* style temples exist at Maluti. Temples dedicated to Kali, Durga, Bamakhepa, and others adhere to this style².

Octagonal temples with pyramidal roofs

An interesting variation in the *char-chala* style of temples at Maluti is octagonal temple having octagonal pyramid as *shikhara*. There are four temples of this style at Maluti. Three temples are fused together at their sides (Fig. 3b); their

pyramidal towers designed similar to those of a temple, a mosque and a church representing the coexistence of people of all religions, though all are Shiva temples².

Rekha deul

Designed in Odishan style², the *shikharas* of these temples have parabolic curvatures composed of horizontal lines unique to Odishan temples. However, McCutcheon (1972) contends that “it is customary to associate these (temples) with the imposing Orissan tradition of which so much still remains, however, it seems likely that pre-Muslim *Rekha deuls* of Bengal were in a tradition coming down through Magadh”⁴. There are only two *Rekha deuls* at Maluti (Fig. 4a) dedicated to Lord Shiva².

Mancha/Rasmancha (stage) style

The *Mancha* style temples have three variants – *Tulsimancha*, *Dolmancha*, and *Rashmancha*. *Rashmancha* is octagonal, larger, and stands on a high plinth. These temples have a special stage suitable for religious and cultural performances. Arched openings on all sides facilitate the deity to be viewed from all directions. A solitary *Rasmancha* temple exists at Maluti built open to sky (Fig. 4b). Instead of Radha-Krishna, this octagonal, roofless *Rashmancha* temple is dedicated to Goddess Kali².

The temples, except *Dalan* style, are adorned with decorative finials in *kalasha* (pot) shape and a pointed top, featuring religious symbols.

Each temple was the conception of the *Pradhan Shthapati* (Chief Architect), who would visualize, plan, and design the temples, distributing works among *Sutradhars* (Artisans) according to their proficiency

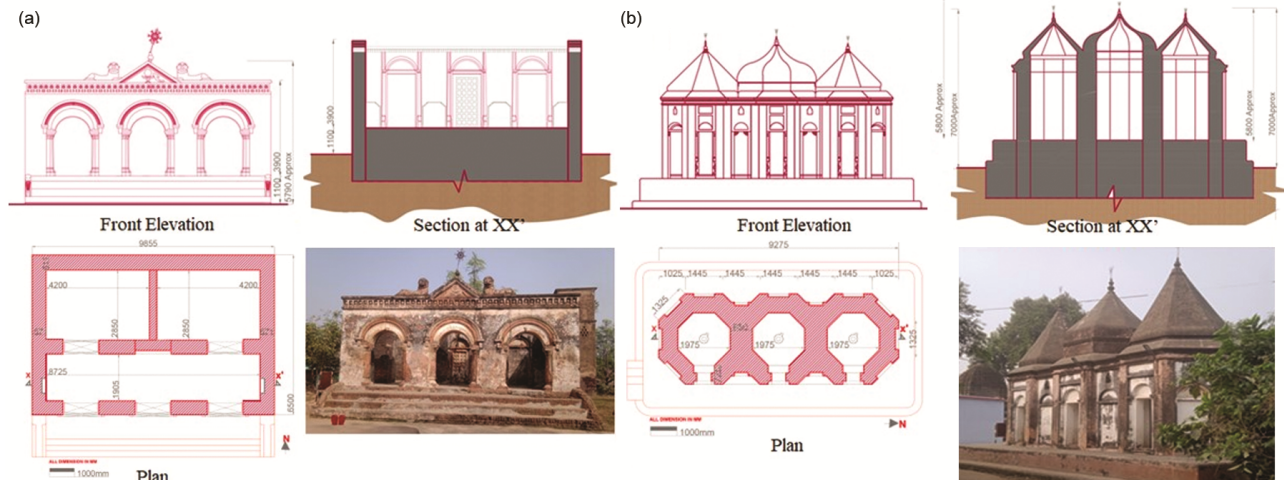


Fig. 3 — Details of (a) a *dalan* style temple, and (b) Octagonal temples with pyramidal roofs

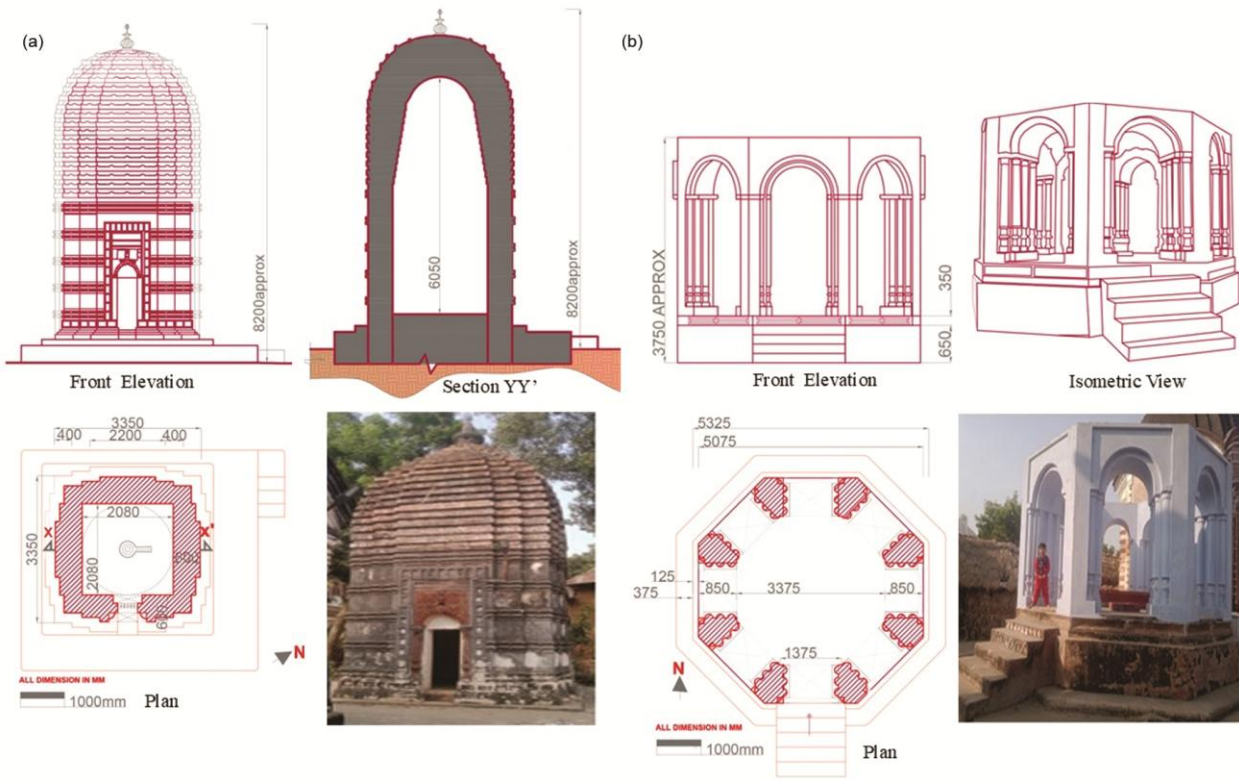


Fig. 4 — Details of (a) *Rekhaeul*, and (b) *Mancha* Temple at Maluti

and inclination². These exquisite temples were created under the patronage of *sutradhars*.

Building materials

The temples at Maluti were constructed using various sizes of thin *Lakhauri* brick and *chuna-Surkhi* (lime-crushed brick aggregate) mortar⁵. Terracotta plaques were used for ornamentation of the front facades, which brought about a distinct variation in their external appearances⁵. The terracotta panels, instead of being carved on walls or being stuccoed, were pasted on the brick surface using *vajralepa* - a paste made using local sand beetle, horse hair, coconut fiber, powdered bricks, molasses, and astringent made from *Aegle marmelos* trees and oil gum resin bee wax, which was decomposed before being used¹.

Terracotta-plaque ornamentation

The use of terracotta plaques for decorating the temple facades is “one of the most original and unique expressions of decorative temple art” of the late medieval Terracotta Temples of Bengal⁵. Terracotta art flourished in Bengal since a long time, and were popular even in Mauryan and Shunga periods². Abundance of alluvial soil or clay in Bengal inspired

the *Sutradhars* to develop these remarkable works of art from this indigenous material. Terracotta influenced “sculpting” and motifs requiring depictions to be “moulded” instead of carving, which was done in stone. Their ingenuity resulted in creation of a variety of terracotta plaques⁵.

Of the 72 temples in Maluti, terracotta plaques can still be seen on the facades of 30 *Chala* temples and two *Rekha deuls*, whereas 26 temples are unadorned. Out of these 32 temples, terracotta facades of 7 are completely undamaged. Partial terracotta adornments exist on 18 temples, whereas on 6 temples, theft of plaques, lack of maintenance and weathering are evident. One of the terracotta temples is completely dilapidated². These plaques were provided only on the front façades making them immensely attractive and covered all sects of Hinduism – Vedic, Shaiva, Vaishnav, etc., irrespective of the deity dedicated. The fundamental ideas were drawn from *Krittivasi Ramayana*, *Kashidasi Mahabharata*, *Shrimad Bhagavad Gita*, *Puranas* and other popular ballads depicted deities mythological characters, picturesque scenes, and various incidents from daily life apart from representing history and socio-political conditions of medieval Bengal².

Inscriptions on the extreme top of the temple facades in Sanskrit, Prakrit, Bengali and Proto-Bangla characters reveal their year of construction in Saka *Samvat* (Saka era), and the names of founders, which were particularly women. The inscriptions involved complexity in understanding the matter inscribed, instead of exposing the dates directly, the numeral digits are in disguise of literature, which need to be deciphered, making them appear like a cipher².

Structural analysis and seismic response characteristics

Site observations, coupled with insights gathered through local interactions and contextual analysis indicate that Maluti’s temples are predominantly constructed on open foundations with stepped footings, typically following the outer profile of the plinth and continuing beneath the load-bearing walls and piers of the superstructure, are composed of the same materials used in the superstructure-*lakhauri* bricks and lime-*surkhi* mortar. The voids are filled with brickbats and lime-*coba* (brick bat cobbing), maintaining uniform material behaviour from the substructure to the superstructure.

This type of foundation aids in distributing the weight of the entire structure evenly preventing differential settlement. It ensures that the centre of gravity of the temples does not rise significantly above ground level. The foundation, along with 3-4

feet high plinth, (Fig. 5a) transfers most of the dead load closer to the natural ground level, consequently lowering the centre of gravity of the temple structure considerably. In *Rekha Deuls* and *Chala* temples, where vertical massing is significant due to their *Shikharas*, this shift in mass distribution becomes particularly important.

All temple types in Maluti follow seismic-safe proportions. The walls are sufficiently thick in relation to their height and span, and openings are strategically placed away from wall corners (Table 2). This shows the local builders’ intuitive understanding of load paths, material behaviour, and seismic safety, long before modern engineering codification.

Diaphragm action and structural integration

A distinct form of diaphragm action is evident in the structural systems of Maluti’s temples (Fig. 5c & Fig. 5d). These structural configurations, based on a nearly square plan, are composed of two parallel walls in one direction and two in the perpendicular, acting integrally under lateral seismic forces to create an integral box action-like structural behaviour, improving lateral seismic resistance, and enhancing overall structural stability.

At the junction of the plinth and vertical outer walls, a tapering brick skirting serves as a transitional stress-distributing element. It increases the contact

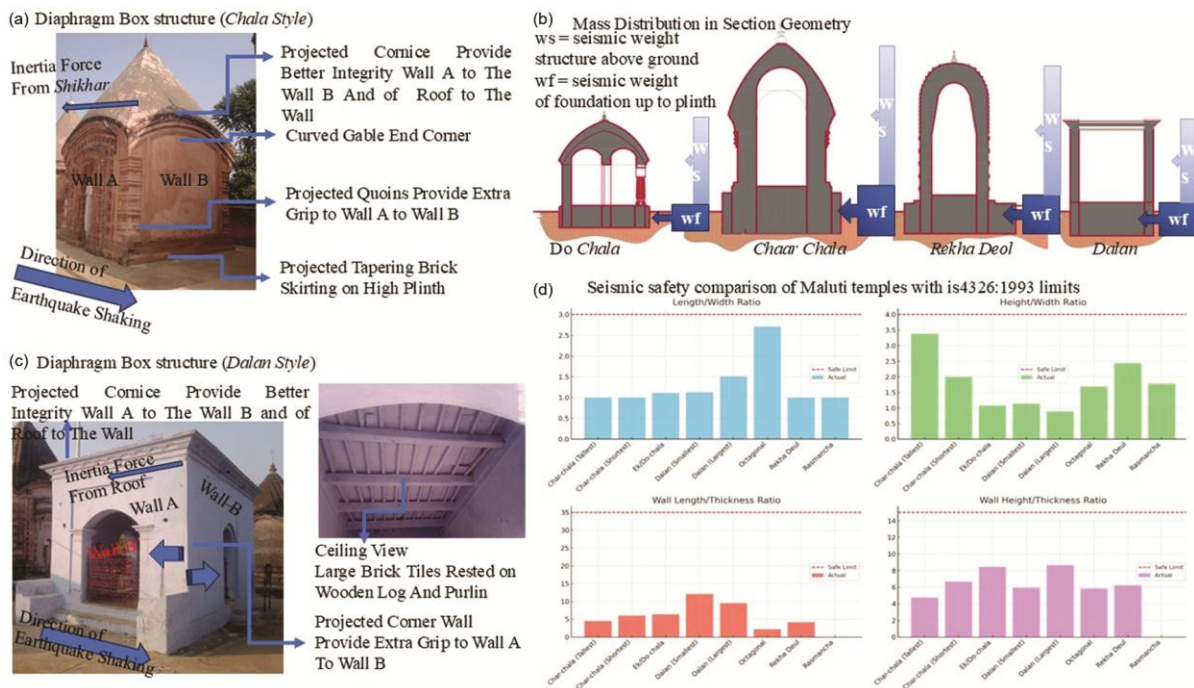


Fig. 5 — Details of (a) Diaphragm box structure (*chala* style), (b) Diaphragm box structure (*Dalan* Style), (c) Mass distribution in Section Geometry and (d) Seismic safety comparison of *maluti* temple with IS 4326: 1993

Table 2 — Seismic analysis of selected temples at Maluti with respect to Is 4326-1993 (Reaffirmed 2003) (Fig. 5b)

S. No.	Temple	Building configuration	Ratio of L:W	Ratio of H:W	Ratio of Wall Length (WL):Wall Thickness (WT)	Ratio of Wall Height (WH): Wall Thickness (WT)	Distance of opening from corner (mm)
1.a.	<i>Char-Chala: Tallest and Largest (Rajabari)</i>	Symmetrical plan and elevation with respect to mass and stiffness	5400: 5400=1 (<3)	18300: 5400 =3.38 (<4)	5400: 1200 =4.50 (<35) (WL<8000 mm)	5700: 1200 =4.75 (<15) (WH>4000 mm)	2200 (>450)
	<i>Char-Chala: Shortest and Smallest (Rajabari)</i>	-DO-	2715: 2715=1 (<3)	5420: 2715 =2 (<4)	2715: 450 =6.03 (<35) (WL<8000 mm)	3000: 450 =6.66 (<15) (WH>4000 mm)	1100 (>450)
1.b.	<i>Ek-Bangla/ Do-Chala style</i>	-DO-	4200: 3775=1.1 (<3)	4558: 4200 =1.08 (<4)	2875: 450 =6.38 (<35) (WL<8000 mm)	3800: 450 =8.44 (<15) (WH<4000 mm)	800 (>450)
2.a.	<i>Dalan style: Smallest (Madhyam Bari)</i>	Symmetrical plan and elevation. Mass is more centric to <i>Garbhagriha</i> and stiffness is sufficient	5440: 4800=1.13 (<3)	5500: 4800 =1.14 (<4)	5440: 450 =12.08 (<35) (WL<8000 mm)	2675: 450 =5.94 (<15) (WH<4000 mm)	871 (>450)
	<i>Dalan style: Largest (Sikkir Bari)</i>	-DO-	9855: 6500=1.5 (<3)	5790:6500 =0.89 (<4)	5220: 550 =9.49 (<35) (WL<8000 mm)	3900: 450 =8.66 (<15) (WH<4000 mm)	1264 (>450)
3.	<i>Octagonal Temples with pyramidal Shikhars</i>	Symmetrical plan and elevation with respect to mass and stiffness	9275: 3416=2.71 (<3)	5800:3416 =1.69 (<4)	1325: 600 =2.20 (<35) (WL<8000 mm)	3500: 600 =5.83 (<15) (WH<4000 mm)	450 (=450)
4.	<i>Rekha Deul</i>	-DO-	2080: 2080=1 (<3)	8200: 3350 =2.44 (<4)	2080: 500 =4.16 (<35) (WL<8000 mm)	3100: 500 =6.22 (<15) (WH<4000 mm)	1218 (>450)
5.	<i>Rasmancha</i>	-DO-	5075: 5075=1 (<3)	3750: 2100 =1.78 (<4)	-NA-	-NA-	571 (>450)

area for load transfer and acts as a barrier against moisture ingress. In addition, projecting brick quoins at each corner act as structural interlocks, "too thing" the orthogonal walls together and improving load continuity and seismic resistance.

This principle is most evident in *dalan*-style temples featuring flat roofs constructed from brick tiles resting on wooden logs and stone slabs. Above these layers, a brick bat *coba*-a composite waterproofing system-is compacted using lime-*surkhi* mortar, a traditional roofing method from Bengal region. This construction creates a horizontal rigid diaphragm that effectively distributes roof inertia forces to the four surrounding walls in proportion to their relative stiffness, further enhancing structural integrity under dynamic loads.

Shikhara and curved gable ends

The *Shikhara* of *Rekha Deul* and *char Chala* temples emerges from a square base and is supported through a pendentive-like masonry transition, which effectively transfers vertical loads to the four load-bearing walls. The upper terminations of the walls are

not capped by triangular gables, as is common in Western architecture. Instead, they employ curved gable ends that smoothly redistribute thrust, minimizing stress concentrations and reducing vulnerability to seismic or cyclonic forces (Fig. 5c). This strategy represents a sophisticated understanding of load flow and stability, making it directly applicable to modern sustainable construction. The pyramidal *Shikhars* do not possess any horizontal or vertical irregularities, enhancing both its grandeur and stability.

Replacing rigid trusses in contemporary vernacular buildings with vaulted or curved gable systems inspired by these temples can enhance both structural resilience and aesthetic continuity with traditional forms.

Elevated plinths and environmental adaptation

A prominent feature across all temples is the use of elevated plinths. These raised platforms safeguard structures against flooding, moisture infiltration, and termite ingress. From a seismic perspective, the plinth acts as a mass damping base, anchoring the structure and helping absorb vibrational energy during earthquakes.

Challenges posed to the temples

Maluti was unknown to the world till recently, mainly due to lack of connectivity, as this remote village is not in close proximity to either a large city served by airport, or any National or State highway. Efforts made by Late Gopaldas Mukherjee – a local resident – since 1968, and publicized in 1979 by the then Director of Archaeology, Government of Bihar⁷ (undivided), which, in 1985-86, repaired them¹.

Later in 2005, initiatives by ‘Save Heritage and Environment’ (SHE) led-Global Heritage Fund (GHF) to declared Maluti (the only Indian site) among 12 most endangered cultural Heritage spots of the world that are deteriorating beyond repair² without “proper restoration and maintenance⁸”. Based on this, National Geographic published, in 2010, a webpage entitled “12 ancient landmarks on verge of vanishing,” which have potential to generate wealth, mentioning neglect, poor drainage, and overgrown vegetation as the main reasons for deterioration of the temples.

However, Maluti attained national fame only after Jharkhand's tableau based on Maluti's temples won in the Republic Day parade in 2015 in New Delhi. Subsequently, the Indian Trust for Rural Heritage and Development (ITRHD) took up conservation, promotion and renovation of the temples⁹ of Maluti – unreachable by public transport till 2015 and electricity from personal solar panels due to long hours without electricity.

Many temples were overrun by uncontrolled growth of wild vegetation with their lodged roots causing structural damage. In some, terracotta plaques were either removed, stolen, covered with thick paint, or eroded due to years of weathering². All the temples have been brought back to their earlier glory (except lost terracotta panels), with *Lakhauri* bricks, lime, *surkhi* mortar, *chhoa* (molasses) and *bel* (Aegle marmelos) used for restoration¹.

However, there are other concerns at present – lack of effort towards widening of the approach roads as visitors to the clusters require passing through narrow lanes, thefts of terracotta plaques, stone quarries nearby releasing fumes and dust that cause deterioration of terracotta panels, cattle roaming inside the clusters, and people continuing to deface the walls of the temples with writings damaging their rich artworks. Fairs organized at the temple clusters attract huge crowds. The locals celebrate *Holi* and *Raas Utsav* of *Radha-Krishna* in the hexagonal, roofless *rasmancha*, which is liable to considerable

structural deterioration. Maluti is threatened by inadequate management of historical temples, and vulnerable to natural disasters. There is a lack of architectural or photographic documentation, which may cause inappropriate changes during restoration leading to the loss of architectural value forever¹.

The Maluti temples face growing neglect as younger generations migrate to cities, weakening traditional community care systems. This has made the temples more prone to theft, especially of valuable terracotta panels. Additionally, extensive damages are caused due to unchecked vegetation – such as root intrusion and climbers.

Discussion

Representing the architecture of Bengal, the temples of Maluti are the most syncretic architectural tradition in the world with arches, vaults and domes being Persian, inspired by buildings of 15th century Bengal Sultanate, curved cornices by huts of Bengal, towers by Odishan temples, façade decoration by Pala style Buddhist *Viharas* and European influences in terracotta panels. Although small and intimate, seen one after the other, Maluti's temples overwhelm viewer's imagination with their exquisite terracotta panels, presenting unique views with several similar temples in a single frame. The simplicity and human scale of the temples reveal that emphasis was on creation of places of worship rather than creating grandeur.

Terracotta being the most inexpensive and common decoration technique used earlier, the temples at Maluti demonstrate how enriched and extravagant appearance can be cost-effective and resilient to earthquakes. Made by firing of natural clay, terracotta is relatively less expensive to produce, is highly durable and resistant to weathering, erosion, and fire, not requiring the need for frequent replacements or repairs, terracotta plaques require minimal maintenance, and can be easily cleaned by washing every 5-10 years. Terracotta panels are good insulators, are versatile offering a wide range of colours and textures and impart tremendous aesthetic appeal, eliminating the need for additional finishes.

Historical monuments are the most tangible legacy of our past and are rich source of archaeological information and should therefore be preserved till eternity¹⁰. Maintaining its remaining temples is a priority of Maluti for an ensured longevity of the architectural marvels. Comprehensive prior digital documentation of each temple at Maluti should be

done for appropriate restoration when struck by a disaster, by creating inventory of the temples, relevant historical information such as date of construction, name of the person commissioning, the deity to whom it is dedicated to, their architectural styles, history, etc. An insight into connectivity initiatives involving high-end drone mapping may contribute to a better understanding of the temple complexes and the village. Architectural and structural drawings with measurements, sizes and shapes of various elements, construction materials, specifications, supported by photography, videography and descriptive text, details of restorations carried out, if any, along with evaluation and description of present condition¹⁰ using laser scanning and photogrammetry is useful to capture intricate details and creating precise 3D models. These augment planning of restoration efforts as well as serve as a records for future generations¹¹.

Malutih as tremendous global tourism potential; its temples can captivate future tourists with the irunique terracotta-based decorations. With its restoration work completed, a newly constructed gateway and a guesthouse, refurbished roads, and improved electric supply, Maluti can entice tourists to explore this temple village for an extended duration.

Removing vegetation once a year and keeping the surface clean from lichens can be the simplest way of preserving the temples by incentivizing villagers to take regular care. The lost or damaged terracotta plaques of several temples need careful replacement by reproducing the intricate designs and patterns for maintaining their aesthetic and historical value. Taking care of future weathering, structural damage, managing bio-deterioration, and other associated problems of all the temples is essential, supported by community engagement that has deep connections to the temples and their traditions.

Infrastructure around the temples is almost non-existent. Lack of security due to absence of boundary walls surrounding the clusters and lack of security guards at the locations are major concerns necessitating construction of walls matching the construction style of the temples, hiring security personals, and installation of surveillance cameras at all locations for monitoring and access control, while ensuring proper drainage, sanitation, sewerage, waste management facilities, appropriate lighting for night-time viewing, providing pathways and appropriate landscape development along these pathways to ensure a directional movement and visit to each temple.

To rejuvenate these temples, a collective narrative may be provided through terracotta plaques in the interior walls of all Shiva temples transforming them through divine representation of captivating incidences from *Shiva Purana* in terracotta plaques to attract devotees of Lord Shiva.

Creating a religious circuit by integrating Maluti into a broader tourism route covering nearby attractions such as Deoghar, Basukinath, Tarapeet, Begunia, and Garui can attract visitors seeking spiritual tourism. Improving connectivity, means of transportation, accommodation, and visitor amenities at site will make the circuit more accessible. Investments in signage, guided tours, and interactive exhibits can further enrich visitor experience.

Establishing a research centre at Maluti for skill development of local artisans by engaging *Sutradhars* expert in traditional terracotta art to replicate historical designs to create plaques, objects, sculptures, panels etc. for sale as souvenirs at outlets to ensure continuity of traditional techniques, preserving craftsmanship, and ensuring consistency of historical practices in future restorations.

Utilizing advanced technologies such as Virtual Reality and Augmented Reality shall provide insights to architects, historians, art enthusiasts, and visitors about evolution, history, techniques, cultural significance, and synthesis of indigenous materials and craftsmanship. Offering immersive experiences, such as display of traditional crafts, offering local cuisines, establishing visitor centres, interpretive displays at abandoned temples, participatory workshops and collaborations with local artists and performers shall increasing awareness of Maluti's heritage locally and globally.

Tourism development can significantly foster sustained economic growth by improving financial conditions, enhancing livelihoods, elevating per capita income of locals by engaging in temple-related businesses, attracting tourists, and in preserving the rich legacy of Maluti for generations to come.

The traditional construction techniques of Maluti's temples offer valuable framework for enhancing sustainability and resilience of contemporary vernacular structures, understanding of vernacular methods of load transfer, material behaviour, and environmental adaptation, developed through centuries of empirical experimentation, which shall prove to be important in reviving vernacular

architecture as well as in providing structural insights and their contemporary applications.

Field observations of vernacular mud houses in the Maluti region reveal lingering traces of temple-inspired construction wisdom—such as tapered walls, articulated plinths, and compact, efficient spatial layouts. However, these practices are rapidly disappearing under the growing influence of carbon-intensive construction materials like cement, concrete, and steel. These temples not only withstand the test of time but also offer adaptable, sustainable models for contemporary construction—ranging from diaphragm action to plinth elevation and vaulted roofs—can foster resilient, low-impact architecture that honours both tradition and innovation.

Maluti, a unique temple village created by the dynasty of Baj Basanta, is a testament to the structural intelligence and environmental wisdom embedded in India's heritage, and among Jharkhand's last standing terracotta heritages¹. Although, Bishnupur is the most renowned place for terracotta temples, Maluti's uniqueness lies in the extensive number of temples in a small area and the variety of designs. The temple complex of Bishnupur comprises only 20 temples, whereas Maluti has 72. The architectural wonders of Maluti are a miniature representation of India's rich cultural tapestry. Considering the uniqueness of Maluti, the village should be included as a World Heritage Site.

Conclusion

This paper delves into the details of the temple village of Maluti, where a large number of terracotta temples exist in a considerably small area highlighting their architectural details through primary surveys of the temples. Inspired from the thatched roofs of mud houses in Bengal, Maluti can also be called the Bishnupur of Jharkhand. Despite considerable restoration, challenges remain. This paper recommends several measures for tourism development in Maluti, intended to increase tourist foot fall. With sustained efforts and increased awareness, the future of the Maluti temples looks hopeful. Overall, the combined efforts of stakeholders are necessary to ensure preservation of Maluti's temples for future generations.

Acknowledgements

The authors sincerely acknowledge the invaluable support extended by the Mauliksha Seva Samiti,

Maluti, Dumka, Jharkhand for extending their cooperation in enabling the measurement and documentation of all 72 terracotta temples comprising a critical component of this research.

Conflict of Interest

The authors declare that there are no conflicts of interest associated with this research work.

Author Contributions

PK: Conceptualization, methodology, field survey, preparation of drawings, investigation, and writing the original draft. AS and VR: supervision, review, editing and proof reading.

Informed Consent

All the respondents provided prior informed consent. All images in this paper are taken by the first author.

Data Availability

The data related to this study will be made available by the corresponding author upon reasonable request.

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